

MANAGING STORMWATER FLOWS IN UPPER BROWN HILL CREEK

The Brown Hill Keswick Creek (BHKC) Stormwater Project is a collaborative effort between the catchment councils of Adelaide, Burnside, Mitcham, Unley and West Torrens to mitigate serious flood risks and help safeguard properties across the catchment of Brown Hill and Keswick Creeks.

In 2013, the Stormwater Management Authority (SMA) endorsed the 2012 Stormwater Management Plan (SMP) for the Brown Hill Keswick Creek catchment.

The main objective of the 2012 SMP is to mitigate the risk and reduce the impact of major flooding on properties within the BHKC catchment, up to and including a 100 year average recurrence interval (ARI) flood. A 100 year ARI flood is also referred to as a 1 in 100 year event, and has a 1% chance of occurring in any given year.

The 2012 SMP groups works into Part A and Part B.

Part A Works: are designed to mitigate flooding generated from the mainly urban sub-catchments in lower Brown Hill Creek and Keswick, Glen Osmond and Parklands Creeks. These works, which comprise approximately 80% of the project, have already commenced.

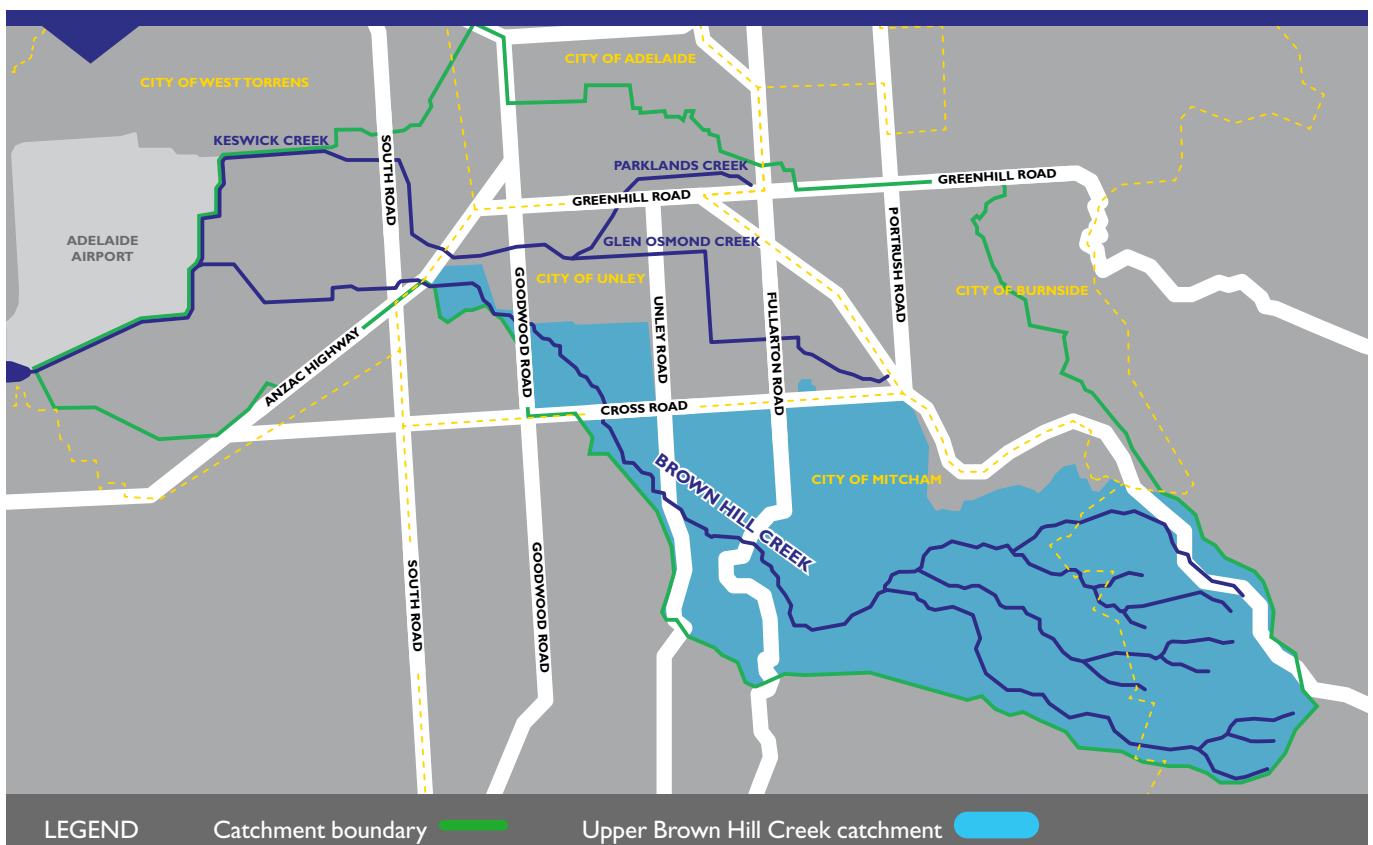
Part B Works: are designed to provide flood mitigation in the upper Brown Hill Creek catchment.

The 2012 SMP identifies a process to investigate and determine Part B based on the councils' preference to pursue a feasible and whole of catchment community supported 'no dam' solution.

This brochure focuses on Part B Works. It outlines the findings of the Part B Process Report prepared by the BHKC Stormwater Project on the investigations of eight options to manage stormwater flows in the upper Brown Hill Creek catchment.

The report identifies Option D – 'Creek Capacity Upgrade' – as the preferred option.

Prior to making any final decisions, the councils will undertake a formal community consultation process. It is anticipated that consultation will commence in March 2015.



Overview

What are the characteristics of upper Brown Hill Creek?

The Brown Hill Keswick Creek catchment comprises four watercourses of which Brown Hill Creek is the most significant, particularly in terms of stormwater flow conveyance.

Upper Brown Hill Creek refers to the section of the creek upstream of Anzac Highway to its source in the rural land of the Mitcham hills. Peak year flows and flooding result from either short duration storms which produce the most flooding from the urban area of the catchment or longer duration storms which produce most flooding from the rural area.

What technical data has changed since the 2012 SMP?

The Part B investigation process has benefited from:

- Revised hydrology (rainfall) data released in mid-2013 by the Bureau of Meteorology and updated runoff forecasts (hydrologic modelling)
- Upgraded hydraulic modelling and floodplain mapping showing the extent of stormwater inundation beyond the watercourse
- Updated project cost estimates based on the revised technical information.

Applying revised data has significantly altered the flood risk profile with:

- Peak flows reduced by up to 25% in parts of the upper Brown Hill Creek catchment

- The estimated number of properties impacted by a 100 year ARI flood over the entire Brown Hill Keswick Creek catchment decreasing from approximately 7,000 (2012 SMP) to just over 2,000 properties – of which approximately 1,200 would experience above-floor flooding.

Due to the reduced level and extent of forecast flooding, a greater length of the creek has the capacity to carry the predicted flood flows.

What mitigation options were considered?

Eight options have been considered. As summarised in the table (see right), the options differ in how they combine the following three components:

1. A detention dam (at one of two sites: Brown Hill Creek Recreation Park or Ellisons Gully)
2. High flow bypass culverts (laid under suburban streets along the relevant route)
3. Creek capacity upgrade works at critical sections of the creek (including bridge upgrade works)

In addition, all of the options include undertaking creek rehabilitation works to rehabilitate the creek towards achieving 'good condition' in order to assist flow capacity along the full length of upper Brown Hill Creek.

These components are described over the page.

How were the eight options determined and assessed?

Investigations commenced with the original five options from the 2012 SMP – being dam based options A1 and A2, and high flow bypass culvert options C1, C2 and C3. Three new options B1, B2 and D were developed in the Part B investigation process.

Options have been assessed based on level of flood protection, estimated costs, environmental impacts and community feedback to date.

All eight options provide approximately the same level of flood protection for the 100 year ARI event. The number of potential flood impacted properties along upper Brown Hill Creek (Mitcham and Unley Council areas) is reduced from over 400 to about 25 properties, with none of those 25 properties likely to experience above floor flooding.

However, initial work indicated that options involving high flow bypass culverts (Options A1, A2, C1, C2 and C3) would be too costly to implement.

For this reason, investigations have focused on Options B1, B2 and D.



Upgrade options

SUMMARY OF FLOOD MITIGATION OPTIONS FOR UPPER BROWN HILL CREEK

OPTION	DETENTION DAM	HIGH FLOW BYPASS CULVERT	CREEK CAPACITY UPGRADE	
A1	Creek rehabilitation along the full length of upper Brown Hill Creek from Anzac Highway to Brown Hill Creek Caravan and Holiday Park	Site 1: Brown Hill Creek Recreation Park	Malcolm Street to Victoria Street*	Anzac Highway to Leah Street; Cross Road to Hampton Street
A2		Site 2: Ellisons Gully	Malcolm Street to Victoria Street*	Anzac Highway to Leah Street; Cross Road to Hampton Street
B1		Site 1: Brown Hill Creek Recreation Park		Anzac Highway to Leah Street; sections between Mitchell and Malcolm Streets; Cross Road to Hampton Street; Fife Avenue
B2		Site 2: Ellisons Gully		Anzac Highway to Leah Street; sections between Mitchell and Malcolm Streets; Cross Road to Hampton Street; Fife Avenue
C1			Hampton Street to Victoria Street via the railway corridor with Malcolm Street leg (Route 3A)*	Anzac Highway to Forestville Reserve; sections upstream of Hampton Street
C2			Hampton Street to Victoria Street via suburban streets (Route 3)*	Anzac Highway to Forestville Reserve; sections upstream of Hampton Street
C3			Hampton Street to Victoria Street via the railway corridor without Malcolm Street leg*	Anzac Highway to Forestville Reserve; sections between Douglas and Malcolm Streets; sections upstream of Hampton Street
D				Anzac Highway to Forestville Reserve; sections between Victoria and Mitchell Streets; Orphanage Park; Douglas to Malcolm Streets; Cross Road to Hampton Street; sections upstream of Hampton Street to Muggs Hill Road

*As detailed in the Part B Process Report.

Under all options, some public road bridges need to be upgraded to meet required flow capacity.

ESTIMATED CAPITAL COSTS (\$M)

COMPONENT	OPTIONS							
	A1	A2	B1	B2	C1	C2	C3	D
Dam	24.1	28.8	24.1	28.8	–	–	–	–
High flow bypass culvert	19.2	19.2	–	–	43.4	46.4	28.6	–
Creek capacity upgrade works	4.4	4.4	6.3	5.4	10.0	10.0	11.0	17.0
Public bridge upgrades	0.9	0.9	1.6	1.6	2.8	2.8	4.0	8.5
Creek rehabilitation	2.9	2.9	2.7	2.7	2.5	2.5	2.3	1.8
Easements	0.4	0.4	1.2	0.6	1.2	1.2	1.4	3.2
BHC diversion by DPTI	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
ESTIMATED TOTAL COST	56.9	61.6	40.9	44.1	64.9	67.9	52.3	35.5

Components of the eight options

Detention dams

A detention dam temporarily stores floodwater generated off the rural area of the catchment during a major storm, reducing the rate of water flowing downstream.

High flow bypass culverts

A high flow bypass system conveys part of the stormwater flow from a creek where flooding occurs and then returns the flow back into the creek further downstream

at a location where the flow can be accommodated. This bypasses existing bottlenecks and avoids creek overflows at particular flood prone locations.

Creek capacity upgrade works

Creek capacity upgrade works involve widening the creek bed and/or modifying the creek banks at critical sections to ensure there is sufficient capacity to convey 100 year ARI peak flows.

Importantly, it is not proposed to create a concrete channel. Instead, the project aims to retain as far as possible a natural creek environment. Where this is not possible, or the sides of the creek banks need further stabilisation, the type of materials that could be used include dry stone walling or gabions (rock filled wire baskets).

See opposite page for artist's impression of 'before' and 'after' treatments showing different types of creek treatments.

Creek rehabilitation works

All eight options include rehabilitating the creek towards achieving 'good condition' in order to assist flow capacity along the full length of upper Brown Hill Creek. This includes removing invasive vegetation (native and non-native) and other obstructions that might impede large water flows.

Although creek owners are responsible (under the Natural Resources Management Act) for maintaining the creek in 'good condition', it is proposed that, in liaison with all creek property owners, the BHKC Stormwater Project

undertakes initial works at the cost of the project to rehabilitate the creek including:

- Selectively removing and cutting back trees and vegetation in the creek bed and side banks that are obstructing flow and therefore increasing the potential for flooding
- Re-planting on top of the banks with suitable native vegetation to ensure the creek is returned as far as possible to an improved and sustainable environment.

The Adelaide and Mount Lofty Ranges Natural Resources Management Board (AMLRNRMB) is preparing a guide to assist property owners understand and carry out their responsibilities to keep the creek in good condition.

An earlier brochure 'Urban Creeks – A property owner's guide to managing healthy urban creeks' produced by the AMLRNRMB in conjunction with the City of Burnside is available on the project website www.bhkcstormwater.com.au

DIFFERENT TYPES OF CREEK CAPACITY UPGRADE TREATMENTS

Before



After – using dry stone walling

After – using gabions (rock filled wire baskets)



Options B1 and B2

Overview

Options B1 and B2 involve the construction of a detention dam (at one of two sites) together with creek capacity upgrade works.

Compared to Option D, these two options:

- Are more expensive than Option D – both in terms of initial capital costs and ongoing maintenance costs
- Provide approximately the same level of 100 year ARI level of flood protection
- Do not satisfy the project councils' endorsed position to give preference to a feasible 'no dam' solution.

Detention dam

Construction of a detention dam is an integral component of Options B1 and B2, with the dam for:

- Option B1 located in the Brown Hill Creek Recreation Park (Site 1)
- Option B2 located on privately owned property in Ellison's Gully (Site 2).

The draft 2011 SMP proposed that a dam be constructed at Site 1. This met with strong community opposition, such that all five councils agreed to pursue a feasible and whole of catchment community supported 'no dam' solution.

Notwithstanding this preference, investigations for Part B works have considered the respective merits of 'dam' and 'no dam' solutions.

The 2013 hydrology data has been applied in developing Options B1 and B2. Use of revised data does not significantly reduce the peak flows from the rural part of the catchment until flows have passed Cross Road. Consequently, dams would have to be the same size as outlined in the 2012 SMP.

Site 1 is in the optimum hydrological location for a dam as it is downstream of the confluence of the two main waterways of the rural part of the catchment. A dam with a 110 megalitres capacity and 12 metres height to spillway would detain nearly all runoff from the rural part of the catchment. A greater reduction in peak flow could be achieved if the dam were higher. However, the watershed created by any increased height would impact on nearby houses.

Due to its location on a tributary of Brown Hill Creek, the Site 2 dam needs to be much larger in size (355 megalitres capacity with wall height of 19.5 metres) to achieve a comparable flood protection performance with a dam at Site 1. The increased capacity of a dam at Site 2 would ensure that runoff from its catchment area when combined with runoff from the remainder of the rural catchment produces the same or better peak flow reduction as the flow from a Site 1 dam.

Creek capacity upgrade works

A dam (at either site) would not mitigate flooding generated off the urban part of the catchment. Therefore both Options B1 and B2 incorporate creek capacity upgrade works at critical downstream sections.

Based on a concept level of investigation, the number of privately owned properties requiring creek capacity upgrade works is estimated to be 29 for Option B1 and 22 for Option B2. Properties are located between:

- Anzac Highway and Ethel Street, Forestville
- Douglas Street and Malcolm Street, Millswood
- Cross Road and Belair Road, Torrens Park
- Mitcham Shopping Centre and Brown Hill Creek Road.

Modifications to the creek through Orphanage Park would also be required, at a lesser extent than for Option D. The nature of creek capacity upgrade works is similar to that for Option D, albeit in some cases the extent of works on each property is less than for Option D due to reduced peak flows under Options B1 and B2.

Preferred option: Option D

Overview

Option D involves upgrading the capacity of the creek at critical sections over the full length of upper Brown Hill Creek, as well as upgrading specific choke points such as bridges.

Option D has been identified by the BHKC Stormwater Project as the preferred option for Part B flood mitigation works as:

- It has the lowest estimated capital cost (\$35.5m) and lowest estimated ongoing maintenance costs compared with the other seven options
- It provides the required (100 year ARI) level of flood protection
- For shorter duration storms it provides a higher than 100 year ARI level of flood protection, thereby providing additional reserve capacity if urban peak flows increase in the future due to redevelopment, climate change or increases in land use density
- It satisfies the project councils' endorsed position to give preference to a feasible 'no dam' solution
- It does not require bypass culverts in suburban streets
- It is within the budgeted cost for Part B works as estimated in the SMP 2012 Stormwater Management Plan
- It preserves existing sites of heritage significance.

Creek capacity upgrade works

Based on a concept level of investigation, creek capacity upgrade works are required at 66 privately owned properties located between:

- Anzac Highway and Ethel Street, Forestville

- Victoria Street and Cranbrook Avenue, Millswood
- Goodwood Road and Mitchell Street, Millswood
- Douglas Street and Malcolm Street, Millswood
- Cross Road and Belair Road, Torrens Park
- Mitcham Shopping Centre and Brown Hill Creek Road.

Preliminary discussions have been held with affected property owners to discuss concerns and opportunities associated with proposed works.

Before any works are carried out the BHKC Stormwater Project would reach agreement with each property owner to agree on detailed designs to increase creek capacity to ensure any works integrate with existing landscape treatments.

To comply with legislation, arrangements for ongoing maintenance – either through an easement or agreement – would also be negotiated with each property owner.

Under both the Natural Resources Management (NRM) Act and the Local Government Act, if permanent infrastructure works are proposed (such as creek capacity upgrade works or bank stabilisation work):

- Works can be carried out under an agreement with the property owner under which the property owner agrees to undertake ongoing care, control and management of the works.
- Where the property owner wants the NRM Board or council to retain ongoing responsibility for care, control and management of the permanent works, then the NRM Board or council must acquire an easement.

The choice of whether there is an agreement or an easement is largely a decision for the property owner.

Creek capacity upgrades are also required:

- At ten road bridges
- Along the creek channel owned by Unley Council between Ethel Street to Leah Street
- On public parks as summarised below. Detailed plans for key reserves and parks would be developed in consultation with the nearby community and user groups.

At Forestville Reserve, the existing concrete creek-lined base in the northern half of the reserve would be removed, the creek bed widened to about 2.5 metres and banks reformed consistent with the already landscaped southern section of the reserve; together with minor re-shaping of the banks along the southern section.

Preliminary options to increase the capacity of the creek through Orphanage Park include widening the creek and/or installing a culvert running underneath the park. Preliminary consultation about these options has been undertaken with nearby property owners, residents and park users. Any works need to recognise the importance of the heritage stone lining and the natural ambience of the area.

A master plan for Soldiers Memorial Gardens, JWS Morris Reserve and Dellwood Reserve was developed in 2011 by the City of Mitcham in consultation with the community. The plan includes laying back the creek banks where possible, installing 'softer' creek stabilisation measures such as gabions and natural stone wall, and replanting the banks with native vegetation.

FOR MORE INFORMATION

This brochure provides a brief summary of the Part B Process Report.

The full report can be viewed:

- online at www.bhkcstormwater.com.au
- at Council offices and libraries

NEXT STEPS

Each of the five councils will consider the Part B Process Report.

A formal community consultation process will be conducted before any decisions are made about the Part B Works. It is anticipated that consultation will commence in March 2015. The outcomes of the consultation process will be reported to the five councils.

Each council will then determine its position and a final recommendation on Part B Works will be made to the State Government.